REMARKS

The enclosed is responsive to the Examiner's Final Office Action mailed on June 2, 2005. At the time the Examiner mailed the Office Action claims 17-49 were pending and, of those, claims 25-36 were withdrawn. By way of the present response Applicants have: 1) amended claims 17, 20, 37, and 44; 2) added claims 50 and 51; and 3) canceled claims 25-36, 38-39, and 45 without prejudice. As such, claims 17-24 and 37-51 are now pending. Applicants respectfully request reconsideration of the present application and allowance of all claims now presented

Independent claim 17 and its dependent claims

Rejections under 35 USC § 102

Claims 17 and 20-21 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Quek* et al. (U.S. Patent No. 6,261,917). Claims 17, 20, and 22-24 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Adler* et al. (U.S. Patent No. 6,259,128).

Independent claim 17 has been amended to recite the limitation of: "forming an electrode layer directly on the conductor structure, wherein forming the electrode layer comprises forming columnar grains of an electrode layer material to be in direct contact with the conductor structure and selectively etching boundaries of the columnar grains." Neither *Quek* nor *Adler*, individually or in combination, disclose or suggest this limitation.

Rather, *Quek* discloses that a barrier metal layer 24, which Examiner equates to the electrode layer of claim 17 on page 2 of the Office Action. The barrier metal layer 24 is deposited over the insulating layer 16. (*Quek*, col. 2, lines 28-29). Then, a metal layer 26 is formed over the barrier metal layer, such as by sputtering or electroplating. (*Quek*, col. 2, lines 32-33). Quek discloses that the metal layer 26 will form the bottom plate electrode of the capacitor. (*Quek*, col. 2, lines 36-37). *Quek* fails to disclose or suggest any other detail regarding the formation of either barrier metal layer 24 or metal layer 26.

Adler discloses that a barrier layer 40, which Examiner equates to the electrode layer of claim 17 on page 4 of the Office Action. The barrier layer 40 is formed over the silicon nitride layer 30. (*Adler*, col. 2, lines 59-60). A bottom electrode 50 may then be formed over the barrier

layer 40. (*Adler*, col. 2, line 66 to col. 3, line 1). *Adler* fails to disclose or suggest any other detail regarding the formation of either barrier metal layer 40 or bottom electrode 50.

Therefore, *Quek* and *Adler*, individually and in combination, fail to disclose or suggest the limitation of "forming an electrode layer directly on the conductor structure, wherein forming the electrode layer comprises forming columnar grains of an electrode layer material to be in direct contact with the conductor structure and selectively etching boundaries of the columnar grains," as required by claim 17.

Therefore, withdrawal of the rejection to claim 17 under 35 USC § 102(e) as being anticipated by *Quek* and the rejection to claim 17 under 35 USC § 102(e) as being anticipated by *Adler* is respectfully requested.

Claims 20-24 depend, directly or indirectly, from claim 17. Therefore, *Quek* and *Adler*, individually and in combination, also fail to anticipate claims 20-24 for at least the reasons discussed above with respect to claim 17. Therefore, withdrawal of the rejection to claims 20-21 under 35 USC § 102(e) as being anticipated by *Quek* and the rejection to claims 20 and 22-24 under 35 USC § 102(e) as being anticipated by *Adler* is respectfully requested.

Rejections under 35 USC § 103

Claims 18 and 19 were rejected under 35 U.S.C. § 103(a) are being unpatentable over *Adler* in view of *Huang* et al. (U.S. 6,218,238).

Claims 18 and 19 depend from independent claim 17. As stated above, *Adler* fails to disclose or suggest the limitation if claim 17 of "forming an electrode layer directly on the conductor structure, wherein forming the electrode layer comprises forming columnar grains of an electrode layer material to be in direct contact with the conductor structure and selectively etching boundaries of the columnar grains." *Huang* also fails to disclose this limitation.

Instead, *Huang* discloses patterning a bottom electrode by etching a conductive layer 108 to form conductive layer 108a, forming a tungsten silicide layer 110 on the conductive layer 108a, and patterning the tungsten silicide 110. (See *Huang*, col. 2, line 46 to col. 3, line 2). *Huang* also discloses forming a bottom electrode 117 of a DRAM capacitor by forming a titanium nitride layer 115 on a conductive layer 108c, depositing a tungsten nitride layer 116 by, for example, chemical vapor deposition or physical vapor deposition on the titanium nitride layer

115, patterning the titanium nitride layer 115 to form a titanium nitride layer 115a, and patterning the tungsten nitride layer 116 to form a tungsten nitride layer 116a. (See *Huang*, col. 4, lines 16-30). *Huang* fails to disclose or suggest any other detail regarding the formation of a bottom electrode.

Therefore, *Huang* fails to disclose or suggest the limitation of claim 17 missing in *Adler* of "forming an electrode layer directly on the conductor structure, wherein forming the electrode layer comprises forming columnar grains of an electrode layer material to be in direct contact with the conductor structure and selectively etching boundaries of the columnar grains."

Therefore, *Adler* and *Huang*, individually and in combination, fail to teach or suggest all the limitations of independent claim 17, upon which claims 18 and 19 depend. Therefore, withdrawal of the rejection to claims 18 and 19 under 35 U.S.C. § 103(a) being unpatentable over *Adler* in view of *Huang* is respectfully requested.

Independent claim 37 and its dependent claims

Claims 37, 40, and 41 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Quek*. Claims 37 and 41 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Adler*. Claims 37, 40, and 41 were also rejected under 35 U.S.C. § 102(e) as being anticipated by *Choi* et al. (U.S. Patent No. 6,168,991). Claim 40 was rejected under 35 U.S.C. § 103(a) are being unpatentable over *Adler* in view of *Huang*. Claims 37, 38 and 41 were rejected under 35 U.S.C. §103(a) are being unpatentable over *Ohnishi* et al. (6,153,460) in view of ordinary skill in the art.

Examiner indicated that dependent claim 39 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Independent claim 37, from which previously pending claim 39 directly depended, has been amended to include a limitation based on the limitation of claim 39. Specifically, claim 37 has been amended to include the limitation of "wherein forming the bottom electrode layer comprises depositing a polycrystalline film of the material and selectively etching grain boundaries of the film with a wet chemical etch." Accordingly, Applicants submit that claim 37 is in condition for allowance. Withdrawal of the rejections to claim 37 is respectfully requested.

Claims 40 and 41 depend, directly or indirectly, on claim 37. Therefore, Applicants submit that claims 40 and 41 are also in condition for allowance for at least the reasons discussed

above with respect to claim 37. Withdrawal of the rejections to claims 40 and 41 is respectfully requested.

Independent claim 44 and its dependent claims

Rejections under 35 USC § 102

Claims 44 and 48 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Quek*. Claims 44, 45, 48, and 49 were rejected under 35 U.S.C. § 102(e) as being anticipated by *Adler*. Claims 44 and 46-48 were also rejected under 35 U.S.C. § 102(e) as being anticipated by *Choi*.

Independent claim 44 has been amended to recite the limitation of "forming directly on the first conductor structure a bottom electrode layer to have a surface having a series of grooves." *Quek*, *Adler*, and *Choi*, individually and in combination, fail to disclose or suggest this limitation.

Quek discloses that a barrier metal layer 24, which Examiner equates to the bottom electrode layer of claim 44 on page 3 of the Office Action. The barrier metal layer 24 is deposited over the insulating layer 16. (*Quek*, col. 2, lines 28-29). Then, a metal layer 26 is formed over the barrier metal layer, such as by sputtering or electroplating. (*Quek*, col. 2, lines 32-33). Quek discloses that the metal layer 26 will form the bottom plate electrode of the capacitor. (*Quek*, col. 2, lines 36-37). Neither the specification nor the Figures in *Quek* disclose forming either the barrier metal layer 24 or the metal layer 26 to have a surface having a series of grooves.

Adler discloses that a barrier layer 40, which Examiner equates to the bottom electrode layer of claim 44 on page 5 of the Office Action. The barrier layer 40 is formed over the silicon nitride layer 30. (*Adler*, col. 2, lines 59-60). A bottom electrode 50 may then be formed over the barrier layer 40. (*Adler*, col. 2, line 66 to col. 3, line 1). As indicated by the Examiner, Figure 3A of *Adler* shows layer 40 as nonplanar. However, *Adler* does not disclose in any Figure, including Figure 3A, or in *Adler*'s specification, that either nonplanar layer 40 or bottom electrode 50 has a surface having a series of grooves.

Choi discloses a deposition of a first conductive electrode layer 20, which Examiner equates to the bottom electrode layer of claim 44 on page 5 of the Office Action. *Choi* discloses depositing the first conductive electrode layer 20 over the exposed surfaces of the second

dielectric layer 12. (*Choi*, col. 4, lines 23-27). *Choi* states that "[m]ethods of depositing a layer [20] of Ta or TaN onto a substrate are well known in the art," and that *Choi* alleged invention "is not limited as to a particular method of deposition. For example, sputtering or chemical vapor deposition (CVD) are commonly used to deposit layers of materials onto a substrate." (*Choi*, col. 4, lines 47-51). As in *Adler*, in *Choi*, the layer which Examiner equates to the bottom electrode layer of claim 44 is nonplanar. However, also as *Adler*, *Choi*'s Specification and Figures fail to disclose or suggest that this layer has a surface having a series of grooves.

Therefore, neither *Quek*, nor *Adler*, nor *Choi*, individually or in combination, disclose or suggest the limitation of "forming directly on the first conductor structure a bottom electrode layer to have a surface having a series of grooves," as required by claim 44. Accordingly, withdrawal of the rejections to claim 44 is respectfully requested.

Claims 45-49 depend, directly or indirectly, on claim 44. Therefore, *Quek, Adler* and *Choi*, individually and in combination, also fail to anticipate claims 45-49 for at least the reasons discussed above with respect to claim 44. Withdrawal of the rejections is respectfully requested.

Rejections under 35 USC § 103

Claim 46 was rejected under 35 U.S.C. § 103(a) are being unpatentable over *Adler* in view of *Huang* et al. (U.S. 6,218,238).

Claim 46 depends from claim 44. As indicated above, *Adler* does not disclose or suggest the limitation of claim 44 of "forming directly on the first conductor structure a bottom electrode layer to have a surface having a series of grooves." *Huang* also fails to disclose this limitation.

Instead, as previously discussed, *Huang* simply discloses patterning multiple layers (e.g. titanium nitride layer 115a, the tungsten nitride layer 116a and the conductive layer 118c) to form a nonplanar bottom electrode. *Huang*'s disclosure does not teach or suggest forming the nonplanar bottom electrode to have a surface having a series of grooves.

Therefore, *Huang* also fails to disclose or suggest the claimed limitation missing in *Adler* of "forming directly on the first conductor structure a bottom electrode layer to have a surface having a series of grooves."

Therefore, neither *Adler*, nor *Huang*, nor the combination thereof, teach or suggest all of the limitations of independent claim 44, upon which claim 46 depends. Withdrawal of the rejection under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

Applicants respectfully submit the present application is in condition for allowance. If the Examiner believes a telephone conference would expedite or assist in the allowance of the present application, the Examiner is invited to call Ms. Van Nguy at (408) 720-8300 x228.

Pursuant to 37 C.F.R. 1.136(a)(3), Applicants hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

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